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FEC

G 108

INSTRUCTION MANUAL

P901

PLUG-IN OUTPUT UNIT

G 108

DATAPULSE

INSTRUCTION MANUAL

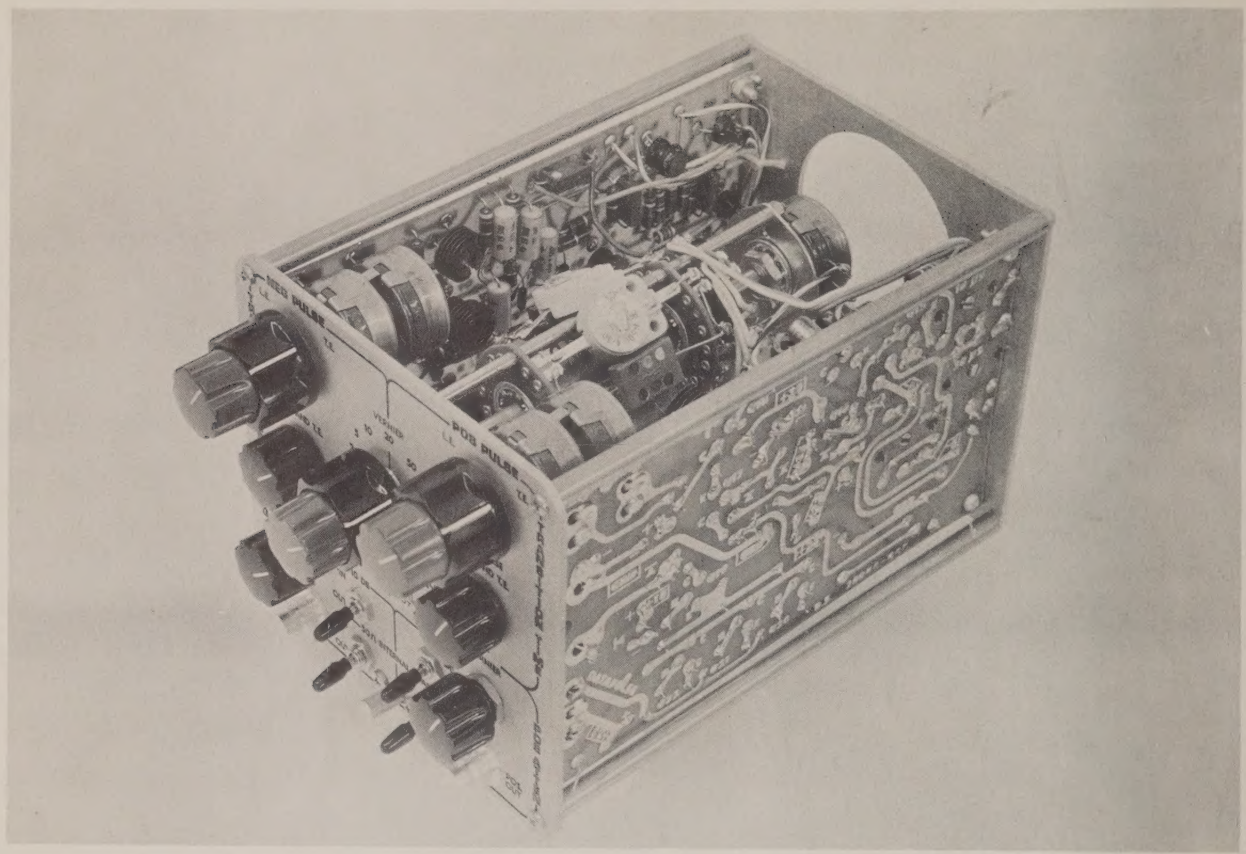
P901

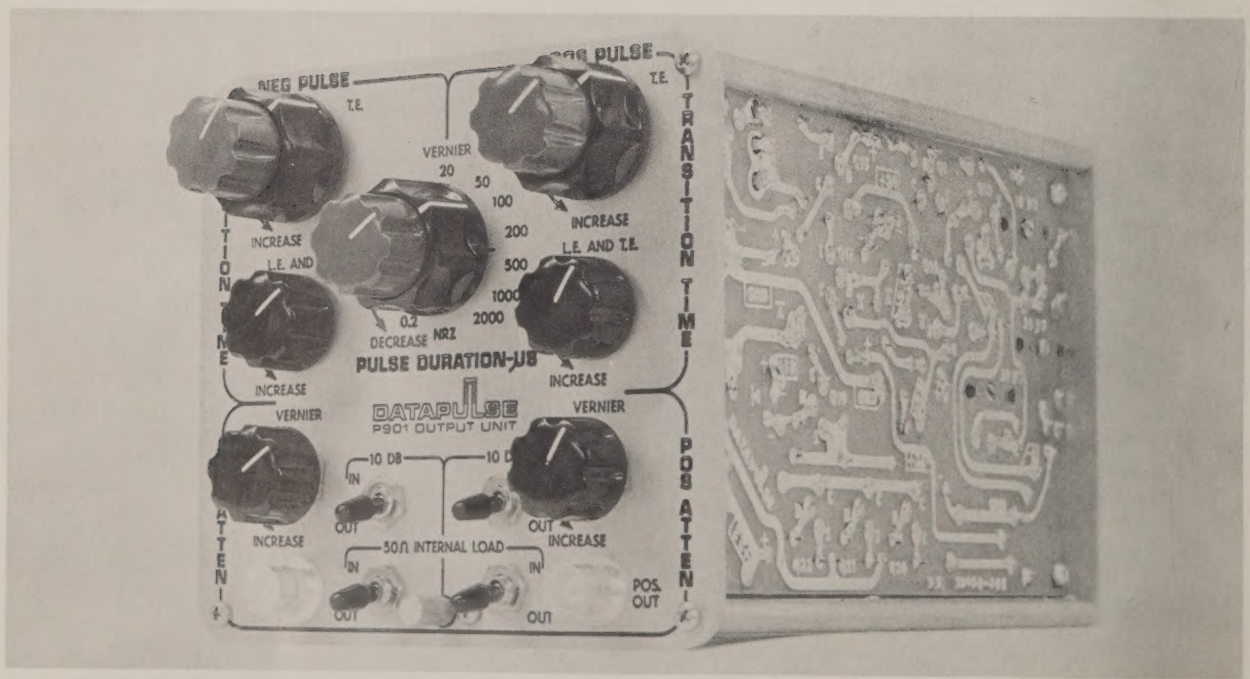
PLUG-IN OUTPUT UNIT

The P901 Plug-in Output Unit is designed for use with DATAPULSE Model 200, 103 and 202 test instruments. The P901 features simultaneous positive and negative output pulses, with independently variable leading and trailing edge transition times; high power, current output pulses; and pulse width variation control from less than 50 nanosec. to 2,000 microsec.

This manual provides detailed instructions for the use and maintenance of your Model 901. A thorough understanding of its contents will contribute to full utilization and longer life of this unit.

DATAPULSE INCORPORATED
509 Hindry Avenue
Inglewood, California
ORchard 1-7713 ORegon 8-3983




NEG PULSE
T.E.
VERNIER
20
50
100
200
500
1000
2000
INCREASE
L.E. AND T.E.
0.2
DECREASE NRZ
PULSE DURATION-μS
INCREASE
INCREASE
L.E. AND
INCREASE
VERNIER
DATAPULSE
P901 OUTPUT UNIT
VERNIER
10 DB
IN
OUT
INCREASE
50Ω INTERNAL LOAD
IN
OUT
IN
OUT
POS. OUT
TRANSITION TIME
POS ATTEN
ATTEN

SPECIFICATIONS

1.1 INPUT TRIGGER REQUIRED

Neg. 2 volt pulse from 100 ohm source, 10 nanosec. rise time, 20 nanosec. wide, 5 mc maximum repetition rate.

1.2 OUTPUT PULSES

Pos. and neg. provided simultaneously, DC coupled with base line effectively at ground (with 50 ohm load or less). Outputs may not be connected to loads at other than ground level or to other signal sources without observing special precautions. The pos. and/or neg. outputs of two units may be mixed (through Type 2301 Mixer Unit, available as an accessory), reducing output amplitude approximately 50%.

1.2.1 Pulse Delay

Leading edge of pulse outputs and transition time of NRZ outputs is delayed from the input trigger approximately 60 nanosec.

1.2.2 Pulse Duration

Both outputs continuously variable, simultaneously, from less than 50 nanosec. to 2,000 μsec., covered in 13 steps (1, 2, 5 series) plus uncalibrated vernier. Also provides non-return-to zero output when used with 200 Series instruments. Step control accuracy is approximately 10%. Circuit recovery time allows operation up to at least 50% duty cycle.

1.2.3 Amplitude

Outputs are current sources, variable in peak amplitude over the stated ranges when driving load impedances of 50 ohms or less (higher impedance loads may be driven with clean output only within the limitations indicated). Separate controls are provided for each output.

Pos. Output: 85 to 260 ma, 13 volts maximum

Neg. Output: 100 to 300 ma, 15 volts maximum

1.2.4 Pulse Width Duty Cycle

With load impedances greater than 20 ohms (35 ohms for NRZ operation), duty cycle is not limited by output circuitry. Ten ohm loads may be driven at duty cycles up to 50%, lower impedances at duty cycles to 30%.

1.2.5 Attenuation

Outputs may be separately attenuated 10 db by front panel switch setting.

1.2.6 Internal Load

An internal 50 ohm load may be switched in for each output to provide proper source impedance to coaxial cables.

1.2.7 Transition Times

The leading edge and trailing edge transitions are essentially linear and may be adjusted simultaneously, or separately with only minor interaction. Any combination of leading and trailing edge times within the ranges specified below may be achieved, within the following limitations: Maximum leading to trailing edge ratio approximately 10:1, maximum trailing to leading edge ratio approximately 3:1, both ratios approaching unity at minimum transition times. Separate controls are provided for the Pos. and Neg. output. Specified ranges may be extended by the addition of capacitors to internal circuitry.

Leading Edge Transition Time: Continuously variable from less than 20 to more than 300 nanosec.

Trailing Edge Transition Time: Continuously variable from less than 20 to more than 200 nanosec.

1.3 POWER REQUIRED

+ 18v at 15 ma *	- 10v at 35 ma
+ 23v at 350 ma *	- 5v at 20 ma
+ 26v at 60 ma *	- 18v at 15 ma *
+ 30v at 55 ma *	- 23v at 300 ma *
+ 35v at 7.5 ma *	- 26v at 60 ma *
+ 10v at 5 ma	- 30v at 55 ma *
	- 35v at 7.5 ma *

All power required is available from standard DATAPULSE plug-in type instruments. Voltages marked * are available only from instruments incorporating Modification M (designated by suffix M on model number stamped on rear nameplate). This modification may be added to basic instruments by the installation of Modification Kit M901, available as an accessory.

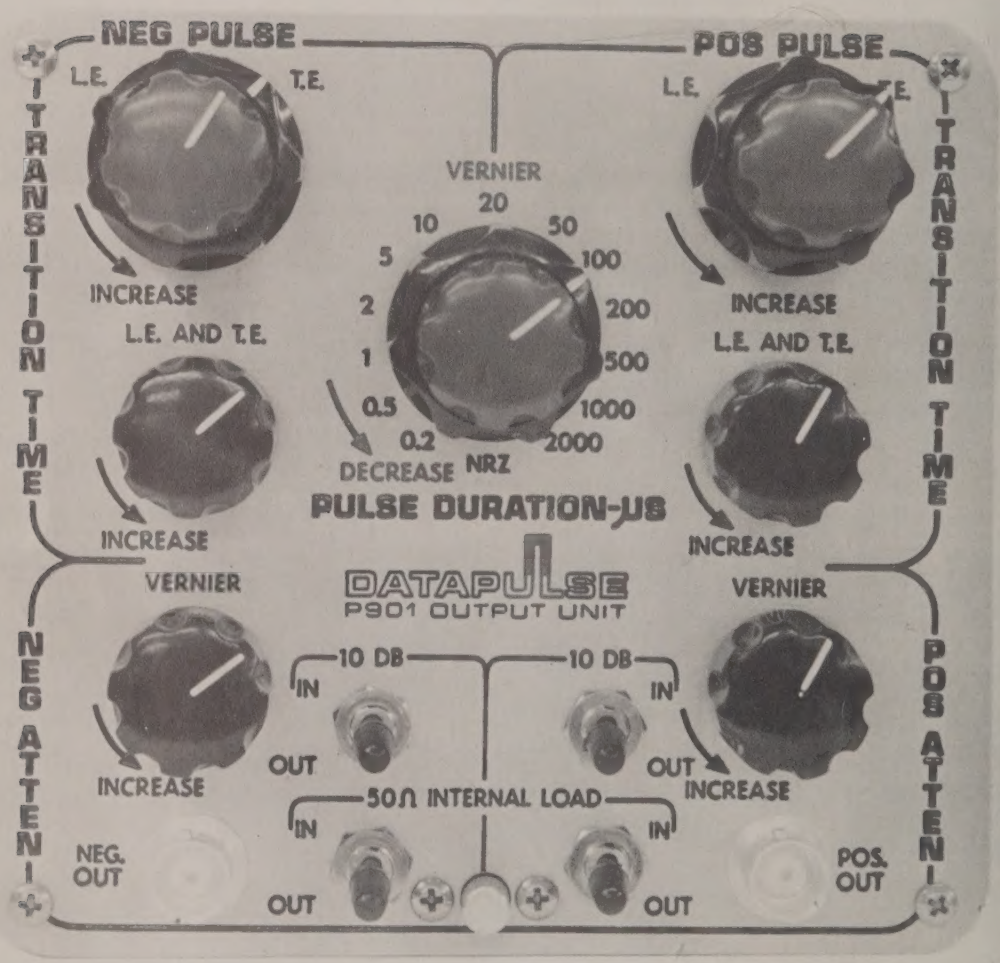
1.4 PHYSICAL

Light gold anodized front panel with etched black and red markings. Plugs into space provided in standard DATAPULSE instruments, mating with 24 contact Blue Ribbon female connector. Front panel output connectors are BNC type. Size is 4 3/8" H x 4 3/4" W x 6 9/16" D.

1.5 ACCESSORIES

Furnished with one operation and maintenance manual section for insertion in basic instrument manual. The following accessories are available: Modification Kit M901 (for incorporation of Modification M in basic instruments), coaxial cables, Type 2002 power termination (50 ohms), Type 2301 Mixer Unit required for mixing outputs.

Figure 2-1. Controls and Connectors (P901)



OPERATING INSTRUCTIONS

2.1 CONTROLS AND CONNECTORS

2.1.1 TRANSITION TIME

2.1.1.1 L.E.: Red concentric knob controls the leading edge transition time of the output pulse *.

2.1.1.2 T.E.: Black concentric knob controls the trailing edge transition time of the output pulse *.

2.1.1.3 L.E. and T.E.: Simultaneously controls the leading and trailing edge transition times of the output pulse.

The righthand transition time controls affect the positive output pulse; the lefthand controls affect the negative output pulse.

2.1.2 NEG. ATTEN. - (Negative Output Pulse Attenuator)

2.1.2.1 Vernier: Controls the attenuation of the negative output pulse power from zero through 10 db when the output is loaded with 50 ohms.

2.1.2.2 10 db: Provides ten decibels attenuation of negative output pulse power when the output is loaded with 50 ohms.

2.1.2.3 50 Ω Internal Load: Provides a 50-ohm resistive load between the negative output pulse and ground.

2.1.3 POS. ATTEN. (Positive Output Pulse Attenuator)

2.1.3.1 Vernier: Controls the attenuation of the positive output pulse power from zero through 10 db when the output is loaded with 50 ohms.

3.1.3.2 10 db: Provides ten decibels attenuation of the positive output pulse.

2.1.3.3 50 Ω Internal Load: Provides a 50-ohm resistive load between the positive output pulse and ground.

2.1.4 Duration - μs, Vernier

Simultaneously controls the positive and negative output pulse widths. Step calibration is made at the factory with all front panel controls turned fully clockwise.

2.2 PLACING IN OPERATION

Plug the P901 in and turn the POWER switch ON. Switch the 50 Ω internal load switches IN.

Make sure the spacing of the input triggers is not less than approximately twice the pulse width as set on the DURATION switch.

Observe the output pulse and vary the controls, observing their operation as explained in Paragraph 2.1 of this manual.

* See Section I for the type of pulse required.

If the P901 seems to be operating improperly, refer to Troubleshooting Procedure in this manual.

CAUTION

The high frequency transistors used for output amplifiers in this unit are limited as to maximum power dissipation.

High duty cycle operation accompanied with low resistive loads on the output may permanently damage these transistors.

With the vernier attenuator set for maximum amplitude, and the 901 plugged into an instrument for proper cooling, the following simple formula may be used to calculate whether the 901 is operating beyond its limits:

$$\frac{\%\ \text{duty cycle} - 30}{\text{total load resistance}} \leq 2$$

2.3 OPERATING CONSIDERATIONS AND SPECIAL APPLICATIONS

2.3.1 When loading either output of the P901 with less than 50 ohms, precaution must be taken to avoid excessive power dissipation in the output transistors. Use the formula given in Paragraph 2.2 when the vernier attenuator dial is set for zero attenuation. If this formula is satisfied, the output transistors are operating within rating.

If the vernier attenuator dial is set so as to limit the output current to 100 milliamperes, the output may be shorted to ground with no adverse effects.

2.3.2 The output amplifiers in the P901 are current generators and must deliver their current into a finite load impedance.

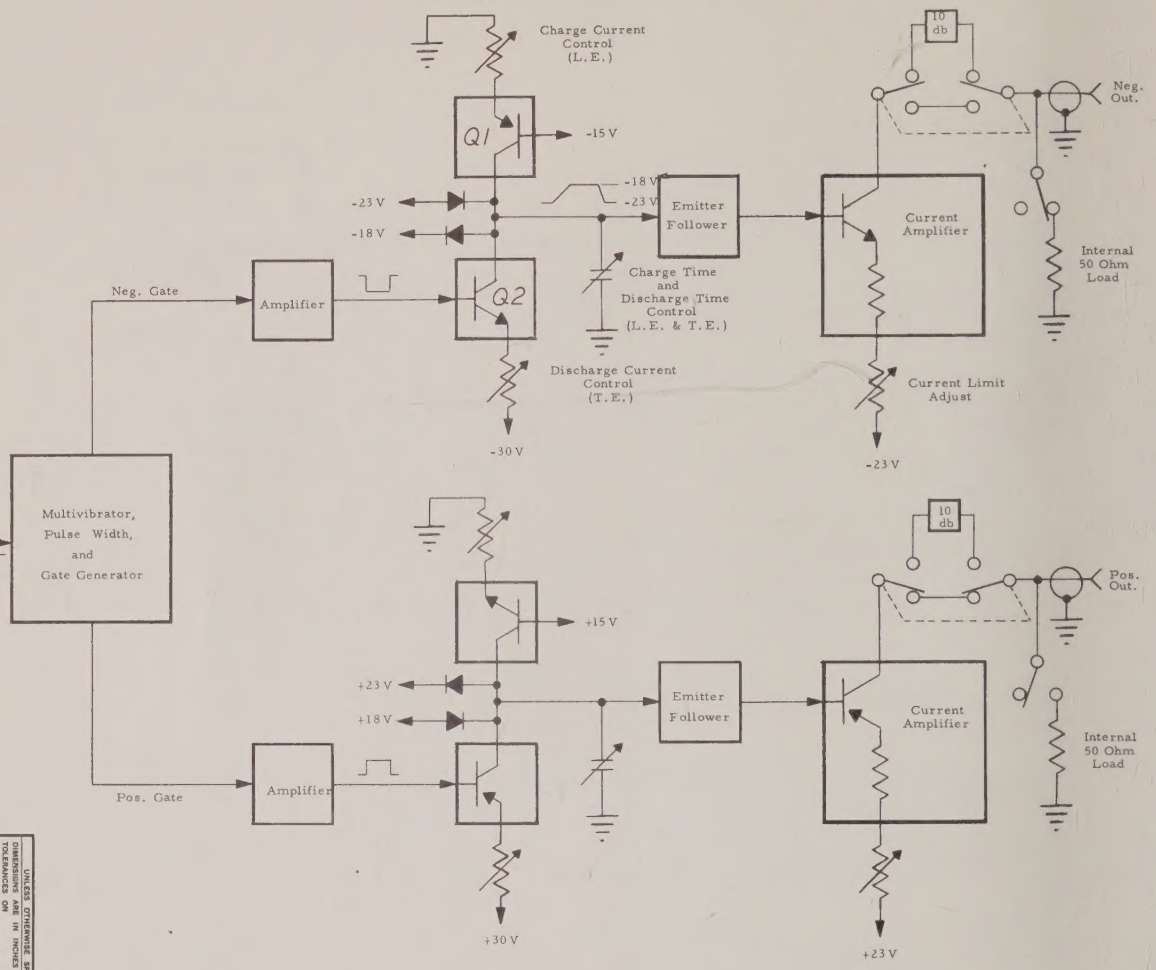
The minimum load impedance is dictated by the maximum output voltage of the P901 (approximately 15 volts).

Accordingly, there must be 50 ohms or less between the output and ground when delivering maximum (300 ma) output current.

2.3.3 When wishing to mix the outputs of two P901's, a DATAPULSE Model 2301 mixing unit must be used.

This mixing unit limits the maximum output power to 7.5 volts from 50 ohms, and changes the output source impedance to 50 ohms.

2.3.4 A possible solution to the output power limitation when mixing would be to replace the 2N726 output transistors with 2N1132's and the 2N796 output transistors with 2N697's. This modification will limit the minimum transition time capabilities of the output pulses to approximately 50 nanosec. instead of 20 nanosec., but would allow the outputs to be mixed directly.



NEXT ASSY | USED ON | NEXT ASSY | FINAL ASSY
APPLICATION | | QTY REQD |

DO NOT SCALE DWG.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON 3 PLACE DEC. ± | 2 PLACE DEC. ± | ANGLES ±
MATERIAL
FINISH

	DRAWN	CHECKED	APPROVED	APPROVED	APPROVED
	B BUSICK				
	7-66-62				
RELEASED					

SCALE NONE

TITLE
BLOCK DIAGRAM—
OUTPUT AMPLIFIER
UNIT P901

DATAPULSE INC.
INGLEWOOD, CALIFORNIA

DWG. NO. 41000-002
SIZE C
SHEET 1 OF 1

LIST OF MATERIALS

ITEM	DESCRIPTION	PART NO.	REQD

REVISIONS

ECN.	DESCRIPTION	DATE	APPROVAL
STM			

THEORY OF OPERATION

(Refer to Block Diagram--Dwg. #41000-002)

Consider the P901 as three basic circuits:

(1) A Pulse Width Gate Generator

(2) A Positive Pulse Amplifier

(3) A Negative Pulse Amplifier

The pulse width gate generator consists of a monostable multivibrator with emitter follower cross-coupled on one side to improve output waveshape. The multivibrator output consists of two gates; a negative and a positive. These gates are used to drive their respective pulse amplifiers. The two pulse amplifiers operate identically in theory and differ only in that the polarized components are reversed. Therefore, only the operation of the negative amplifier will be explained.

Two stages of DC amplification change the DC level of the negative gate to drive the charge and discharge current transistors Q1 and Q2.

In a quiescent condition, Q2 is conducting and the voltage at its collector is held at -23 volts by the diode clamp. When the input gate goes negative, Q2 is turned off and the voltage at its collector rises at a rate determined by the current through Q1 and the capacity of C_1.

$$\frac{dE}{dt} = \frac{I_{(Q1)}}{C_{(1)}}$$

The voltage is clamped at -18 volts until the pulse width gate allows Q2 to conduct. The voltage now returns to -23 volts at a rate determined by the current through Q2 and the capacity of C_1.

It should now be evident that the charge current control, the discharge current control and C_1 correspond to the front panel NEG. PULSE - TRANSITION TIME controls, L.E., T.E., and L.E. and T.E. respectively.

The waveform at the collector of Q2 is amplified by an emitter follower, which drives the output current amplifier.

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4.1 PREVENTIVE MAINTENANCE

4.1.1 Cooling

The P901 utilizes forced-air cooling to maintain tolerable temperatures within the unit at specified maximum output power. It is important that the covers supplied with the instruments to which the P901 is connected be kept in place during operation.

4.1.2 Recalibration

The P901 contains very stable circuitry and the unit will provide many hours of trouble-free operation. To insure continued reliability, the power supply and pulse width multivibrator should be checked for calibration after each 500 hours of operation, or at least every six months if the plug-in is used intermittently.

4.1.3 Visual Inspection

Conduct visual inspections at regular intervals, preferably every few months. Check for possible circuit defects including loose or broken connections; scorched printed circuit boards, wires, or resistors; and loose nuts and bolts.

4.1.4 Component Replacement and Soldering Connections

When replacing transistors, diodes, or other heat-sensitive devices, a heat sink should be used between the device and the soldering iron tip. A pair of long-nosed pliers may be used in most cases.

Special care must be taken, when soldering printed circuit wiring, to avoid overheating and subsequent separation of the printed circuit from its epoxy material.

4.2 TROUBLESHOOTING PROCEDURE

The first points to check after most malfunctions are the power supply voltages.

The voltages used for the P901, except for the ± 18 volt supplies, should be within ± 5% of their specified value. Note, that most of the voltages must be adjusted in a certain sequence due to the referencing.

The sequence which must be used is as follows:

(1) + 10v
(2) - 10v
(3) - 5v
(4) - 23
(5) + 23
(6) any of the others

The following table should prove useful in isolating malfunctions within the unit. Once the area of trouble is isolated, the waveform diagrams and schematic diagrams in this manual may be used to locate the defective components.

TABLE 4-1

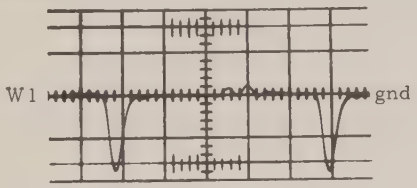
TROUBLESHOOTING CHECKS

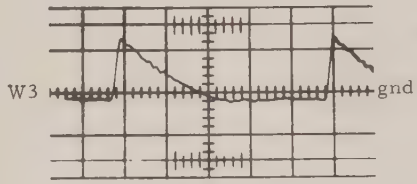
MALFUNCTION	POSSIBLE CAUSE
NO OUTPUT PULSE * W11 (OR W21)	
Check for →	1. Check for absence of pulse load 2. Output Current Amplifiers Q12, Q13, and Q14, (or Q20, Q21 and Q22).
NO DRIVING PULSE FOR OUTPUT STAGE - * W10 (OR W20)	
Check for →	Pulse Shaping Circuits and Emitter Follower Q9, Q10, Q11 (or Q17, Q18 and Q19).
NO GATE INPUTS - * W8 (OR W18)	
Check for →	Gate Amplifiers Q7 and Q8 (or Q15 and Q16).
NO NEGATIVE OR POSITIVE GATES FROM MULTIVIBRATOR	
Check for →	1. Check for absence of input trigger 2. Multivibrator inoperative: Q1, Q2, Q3, Q4, Q5, Q6. Check waveforms W1 through W5*.

* See Table 4-2, Characteristic Waveforms

TABLE 4-2. CHARACTERISTIC WAVEFORMS

The waveforms shown here should prove useful during troubleshooting. These photographs were taken with a Tektronix Type 580 Oscilloscope with a Type K Plug-in. Waveform numbers (W1, W2, W3 etc.) shown at the left of each waveform correspond to the numbers appearing on the schematic, drawing J40000-011.



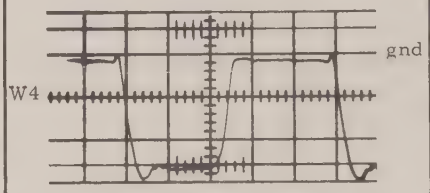


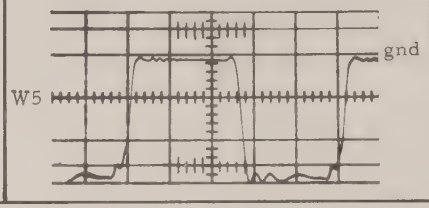
0.1 μs/cm 2v/cm
Trigger Rate: 2 mc/sec.
Pulse Duration: 0.2 μsec.

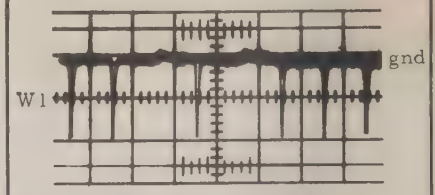
W1: Set Trigger Input
W2: Base Lead of Q3

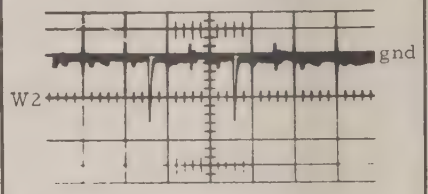
0.1 μs/cm 2v/cm
Trigger Rate: 2 mc/sec.
Pulse Duration: 0.2 μsec.

W4: Collector Lead of Q3
W5: Collector Lead of Q6



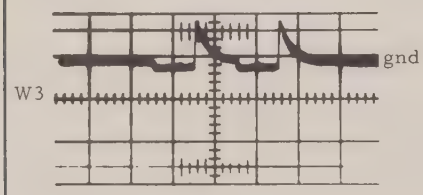


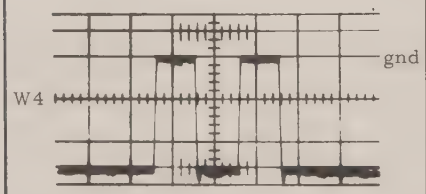




0.1 μs/cm 2v/cm
Trigger Rate: 1 mc/sec.
Pulse Duration: Set at NRZ

W1: Set Trigger Input
W2: Reset Trigger Input
(only available with 200 series word generators)
(Program 11010111)



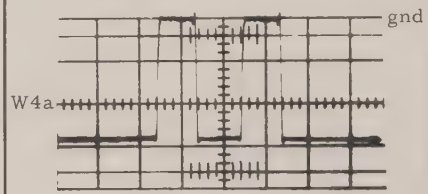


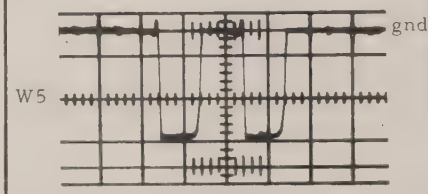
0.1 μs/cm 2v/cm
Trigger Rate: 1 mc/sec.
Pulse Duration: Set at NRZ

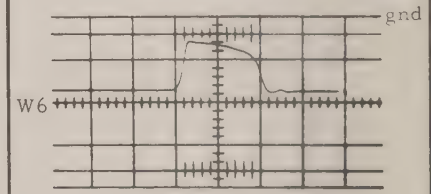
W3: Base Lead of Q3
W4: Collector Lead of Q3
(Program 11010111)

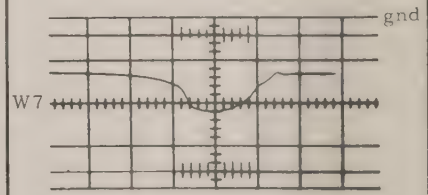
0.1 μs/cm 2v/cm
Trigger Rate: 1 mc/sec
Pulse Duration: Set at NRZ

W4a: Emitter Lead of Q5
W5: Collector Lead of Q6



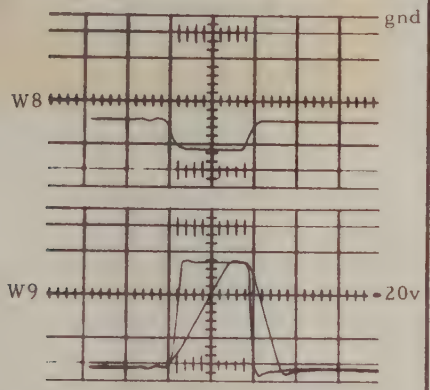






0.1 μs/cm 10v/cm
Pulse Duration: 0.2 μsec.
W6: Collector Lead of Q7
W7: Collector Lead of Q8

TABLE 4-2. CHARACTERISTIC WAVEFORMS -- CONTINUED

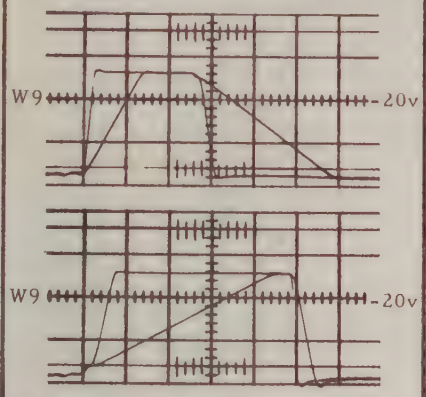


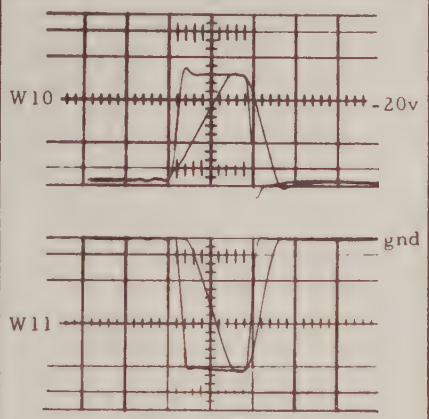
0.1 μs/cm 2v/cm
Upper: Pulse Duration: 0.3 μs, "L.E." cw, "T.E." ccw, "L.E. & T.E." first cw then ccw.
Lower: "L.E" ccw, "T.E." cw, "L.E. & T.E." first cw, then ccw.

W9: Junction of CR104 & CR105

Upper: 0.1 μs/cm, 10v/cm
Lower: 0.1 μs/cm, 2v/cm
Pulse Width: 0.2 μs.
Lower: "L.E." clockwise (cw), "T.E." (cw), "L.E. & T.E." first cw, then ccw.

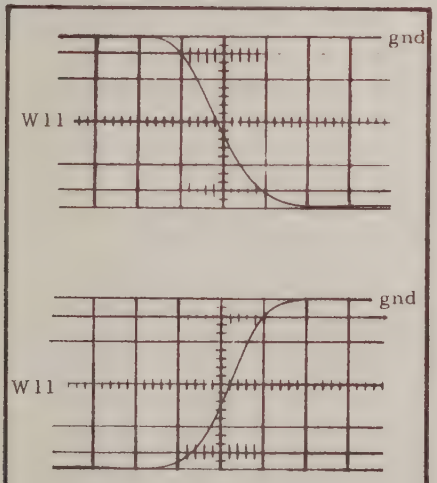
W8: Base Lead of Q9
W9: Junction of CR104 & CR105





0.1 μs/cm, Upper 2v/cm, Lower 5v/cm, Pulse Duration 0.2 μs, "L.E." cw, "T.E." cw, "L.E. & T.E." cw, then ccw.

W10: Emitter Lead of Q11
W11: Output Pulse



10 nanosec/cm 3.75v/cm
Output Pulse Waveforms showing Typical Rise and Fall Times (Neg. Pulse Output)

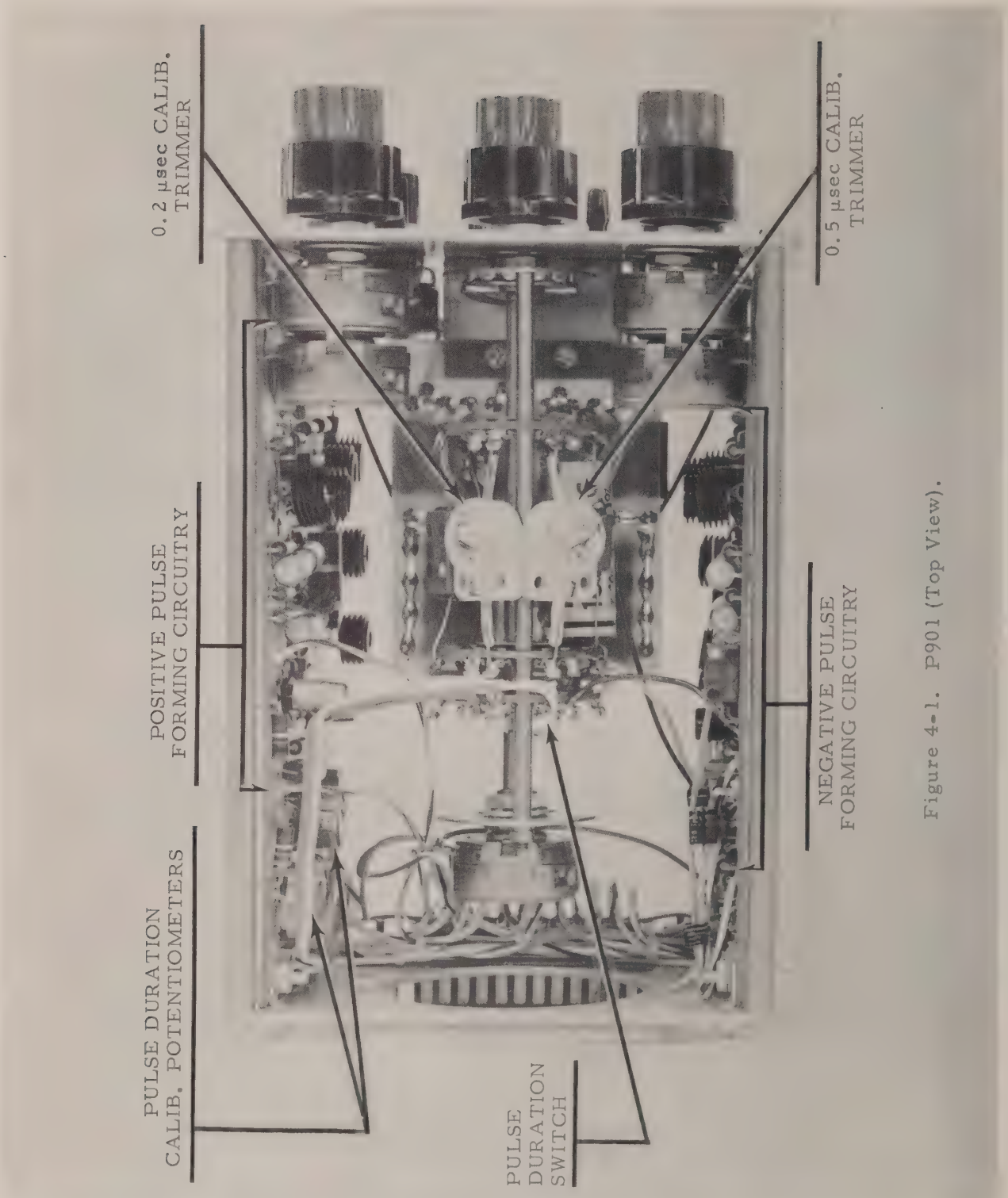


Figure 4-1. P901 (Top View).

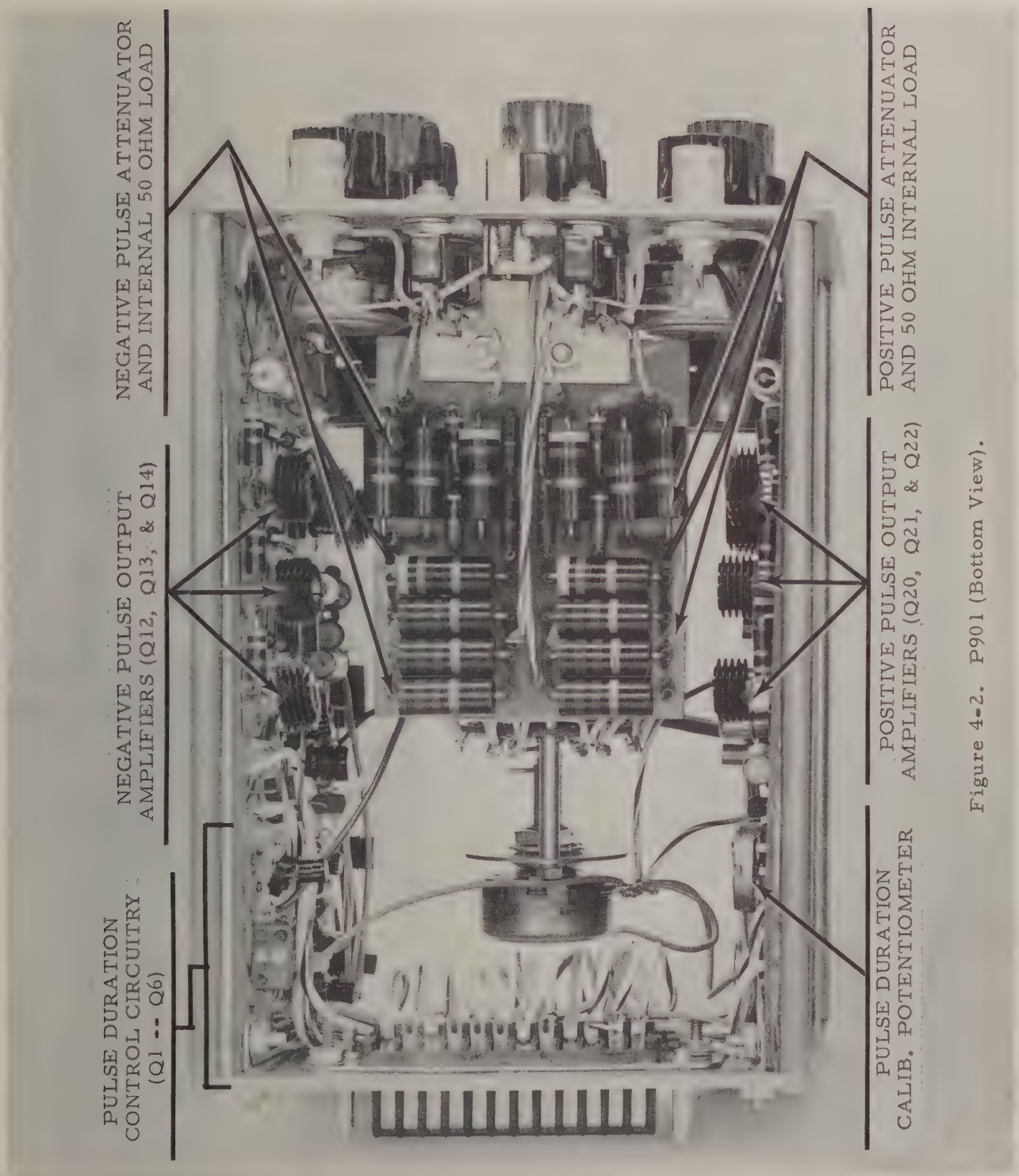

PULSE DURATION CONTROL CIRCUITRY (Q1 -- Q6)
NEGATIVE PULSE OUTPUT AMPLIFIERS (Q12, Q13, & Q14)
NEGATIVE PULSE ATTENUATOR AND INTERNAL 50 OHM LOAD
PULSE DURATION CALIB. POTENTIOMETER
POSITIVE PULSE OUTPUT AMPLIFIERS (Q20, Q21, & Q22)
POSITIVE PULSE ATTENUATOR AND 50 OHM INTERNAL LOAD

Figure 4-2. P901 (Bottom View).

4.3 CALIBRATION PROCEDURE

4.3.1 Equipment Required

DC oscilloscope--Tektronix 541, Hewlett-Packard 150A or equivalent.

DC voltmeter--Any voltmeter with greater than 100 ohms per volt sensitivity, calibrated to ± 5%.

4.3.2 Power Supply

The power supply (and adjustments thereto) for the P901 are located in the instrument with which the P901 is used. The + 23v and - 23v supplies must be adjusted before the other voltages. All voltages should be within ± 5% of the stated values except + 18v and - 18v, these voltages are adjusted at the factory for limiting the output current in the 901.

4.3.3 Pulse Duration - μsec. (A Tektronix Type 541 oscilloscope or equivalent is needed for this calibration)

On the right side card of the P901 there are three screwdriver-adjust controls, labeled 50 μsec., 20 μsec., and 10 μsec.

Set the oscillator switch in the main instrument for 1 kc or less and the pulse delay for minimum delay.

Set the PULSE DURATION switch to 50 μsec. and turn the vernier control fully clockwise and leave it there throughout the rest of the calibration.

Observe the positive or negative output pulse with all rise and fall time controls fully clockwise, for measurement.

Adjust the 50 μsec. calibration control for 50 μsec. pulse width.

Turn the PULSE DURATION switch to 20 μsec. and adjust the 20 μsec. calibration control for 20 μsec. pulse width.

Turn the PULSE DURATION switch to 10 μsec. and adjust the 10 μsec. calibration control for 10 μsec. pulse width.

No further calibration should now be necessary; however there are trimmer condensers on the PULSE DURATION switch to adjust the .5 μsec. and 2 μsec. ranges if further calibration accuracy is desired on these ranges.

4.4 SPECIFICATION VERIFICATION

4.4.1 Amplitude

With no external load, with the 50 Ω internal loads switched IN, and with the 10 db step attenuators OUT, turn the attenuator vernier controls fully clockwise and check for:

a. Positive Pulse Amplitude = 13 volts.

b. Negative Pulse Amplitude = 15 volts.

Switch 10db attenuators IN and notice approximately 3 to 1 amplitude reduction.

Switch 10 db attenuators OUT and vary the vernier controls counterclockwise, noting a smooth variation of amplitude from full amplitude to less than the 10 db step amplitude.

4.4.2 Pulse Duration

Set all transition time controls fully clockwise.

With vernier control clockwise, check for output pulse width calibration at front panel switch position settings (13 settings).

Tolerance is ± 3% on .2 μsec., .5 μsec., 10 μsec., 20 μsec., and 50 μsec. ranges; ± 10% on all others.

Check for greater than 2.5 : 1 variation of pulse width with vernier control variation.

4.4.3 Leading Edge Transition Time

Set trailing edge transition time at minimum (fully clockwise).

Vary the "L.E." and "L.E. and T.E." controls and notice a leading edge transition time variation of at least 20 nanosec. to 300 nanosec.

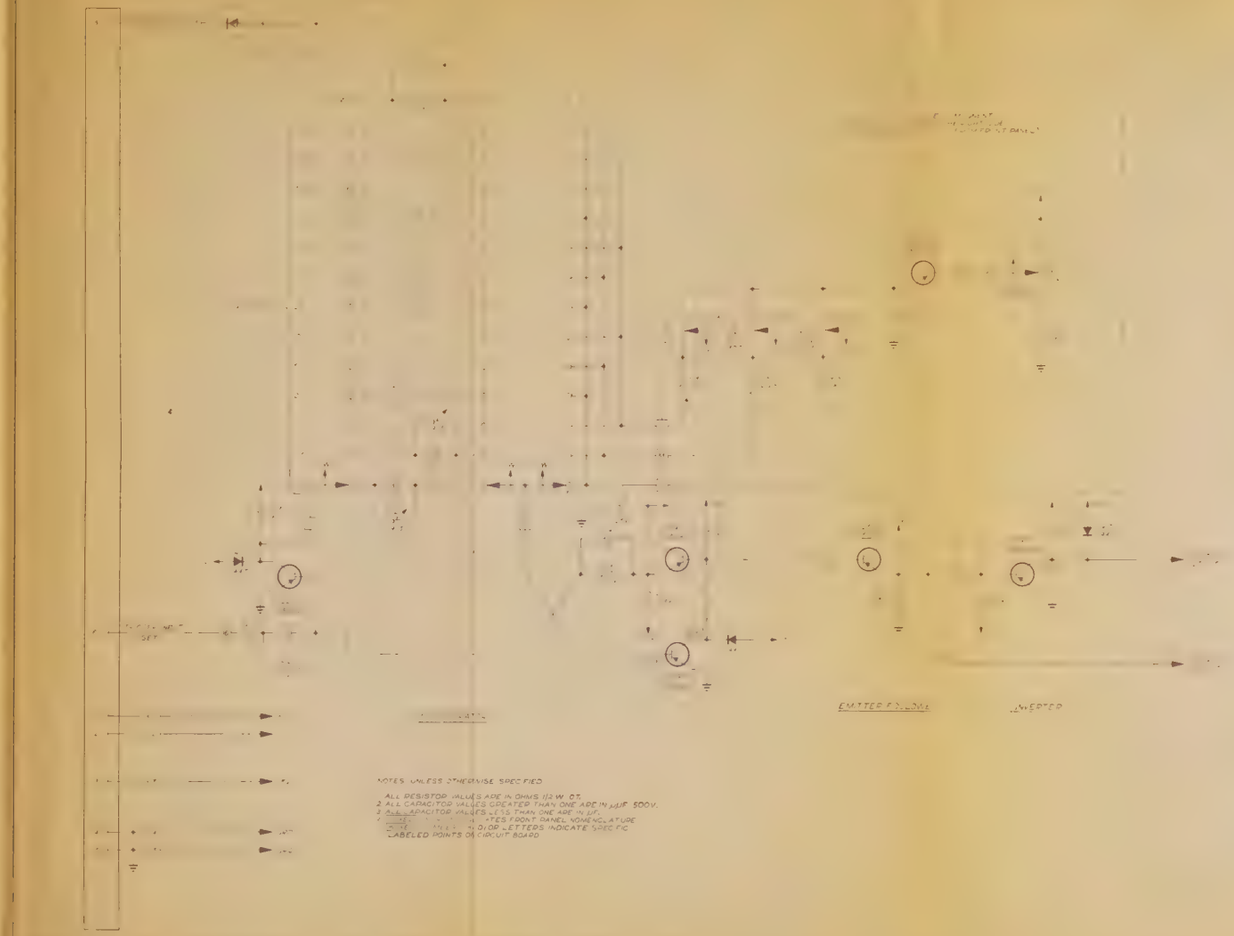
4.4.4 Trailing Edge Transition Time

Set leading edge transition time at minimum (fully clockwise).

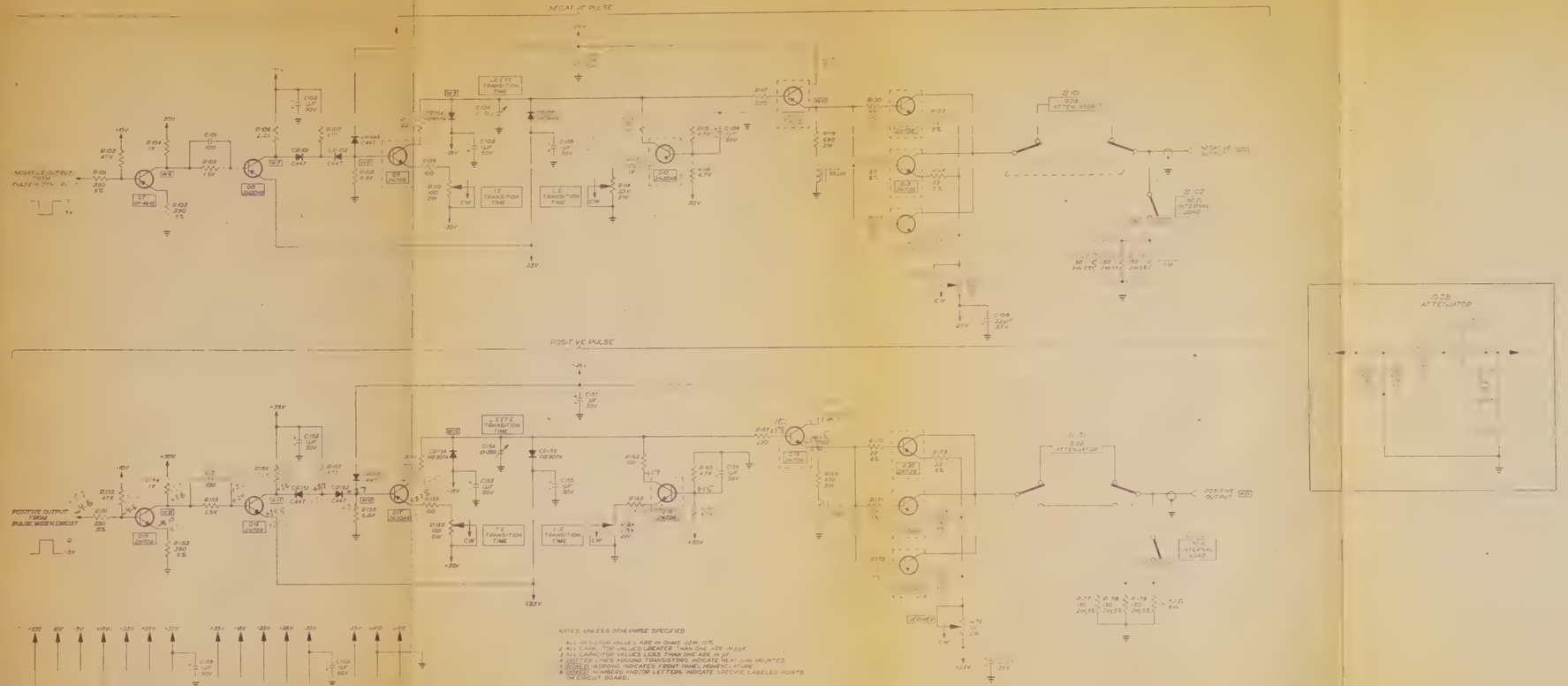
Vary the "T.E." and "L.E. and T.E." controls and notice a leading edge transition time variation of at least 20 nanosec. to 200 nanosec.

THE FOLLOWING TRANSISTORS MAY BE USED INTERCHANGEABLY IN THIS INSTRUMENT:

T6027	2N984	
2N226	2N375	
2N35	2N1302	
TI482	2N697	SM1310
2N696	2N697	SM1310



NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTOR VALUES ARE IN OHMS 1/2 W ±5%
2. ALL CAPACITOR VALUES GREATER THAN ONE ARE IN MMF 500V.
3. ALL CAPACITOR VALUES LESS THAN ONE ARE IN MF.
4. [illegible] REFERS TO FRONT PANEL NOMENCLATURE
5. [illegible] 4,01 OR LETTERS INDICATE SPECIFIC LABELED POINTS ON CIRCUIT BOARD


NEGATIVE PULSE
POSITIVE PULSE
NEGATIVE OUTPUT FROM PULSE WIDTH CIRCUIT
POSITIVE OUTPUT FROM PULSE WIDTH CIRCUIT
S1:01 0 DB ATTENUATOR
S1:02 50Ω INTERNAL LOAD
S1:51 0 DB ATTENUATOR
S1:52 50Ω INTERNAL LOAD
NEGATIVE OUTPUT
POSITIVE OUTPUT
10 DB ATTENUATOR
NOTES UNLESS OTHERWISE SPECIFIED
1. ALL RESISTOR VALUES ARE IN OHMS, 1/2W, 10%.
2. ALL CAPACITOR VALUES LESS THAN ONE ARE IN μμF.
3. POSITIVE LEAD AROUND TRANSISTORS INDICATE HEAT SINK MOUNTED.
4. DOUBLE AGRONG INDICATES FRONT PANEL NOMENCLATURE.
5. DOUBLE NUMBERS AND/OR LETTERS INDICATE SPECIFIC LABELLED POINTS ON CIRCUIT BOARD.
SCHEMATIC - OUTPUT AMPLIFIER
4000-311

P-901 CHECKOUT PROCEDURE

Date 12/18/62

Serial # 050

ter thorough visual inspection:

1. Set pulse width pots at mid position.

2. Check each of the L. E. & T. E. variable condensers (10-360pf) for shorts and see that they are set for minimum capacity when front panel controls are set fully clockwise.

3. Turn all front panel controls (except the pulse duration switch) fully clockwise.

4. Set pulse duration switch on 10 μ sec range.

5. Switch 10 db attenuator OUT.

6. Switch internal 50Ωloads IN.

R THE FOLLOWING CALIBRATIONS MAKE SURE THE INPUT TRIGGERS TO THE P-901 VE A SPACING OF AT LEAST TWICE THE PULSE WIDTH BEING CALIBRATED.

Initials

7. Plug the unit into an appropriate instrument.

8. OBSERVE THE NEGATIVE OUTPUT PULSE. Adjust for 15v output by varying the -18v supply slightly. (adjustment in the instrument with which the 901 is being used.) ___JH___

9. *Adjust the 10 μ sec cal pot for correct pulse width (±2%) ___JH___

0. Set Pulse duration switch on 20 μ sec range.

1. *Adjust the 20 μ sec cal pot for correct pulse width (±2%) ___JH___

2. Set pulse duration switch on 50 μ sec range.

3. *Adjust the 50 μ sec cal pot for correct pulse width (±2%) ___JH___

4. *Check for correct pulse width on 100, 200, 500, 1000, 2000, 2, 5, & 10 μ second ranges (±10%) ___JH___

5. Set pulse duration switch on 0.2 μ sec range.

6. *Adjust .2 μ sec cal trimmer condenser for correct pulse spacing (at 50% amplitude points) (±5%). ___JH___

7. Set pulse duration switch on 0.5 μ sec range.

18. *Adjust .5 μ sec cal. trimmer condenser for correct pulse spacing. (at 50% amplitude points) (±5%) ____

19. Check for correct pulse width on 1.0 μ sec range (±5%). Check for vernier variation to less than .4 μ sec and then reset vernier control to c. w. position. ____

20. Throw the Neg Atten 10 db switch IN and notice approx. 3 to 1 amplitude reduction. ____

21. Switch the 10 db attenuator OUT and vary the vernier control counter clockwise noting a smooth variation of amplitude from full amplitude to less than the 10 db step amplitude. ____

22. OBSERVE THE POSITIVE OUTPUT PULSE
Adjust for 13v output by varying the +18v supply slightly. (Adjustment in the instrument with which the P-901 is being used.) - Observe correct pulse width.

23. Throw the POS attenuator 10 db switch IN and notice approx. 3 to 1 amplitude reduction.

24. Switch the 10 db attenuator OUT and vary the vernier control counter clockwise, noting a smooth variation of amplitude from full amplitude to less than 10 db step amplitude. ____

Vary the "L. E." and "L. E. & T. E." controls and notice a leading edge transition time variation of at least 20 Nsec to 300 Nsec (check on POS and NEG outputs.) ____

26. Set the Transition time "L. E." controls c. w.

27. Vary the "T. E." and "L. E. & T. E." controls and notice a trailing edge transition time variation of at least 20 Nsec to 200 Nsec. ____

Q. C. ACCEPTANCE	
INSPECTOR	DATE
QA 4	DEC 18 1962

WARRANTY

Datapulse Incorporated warrants each instrument of its manufacture to be free from defects in material and workmanship. Our obligation under this Warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to making good at our factory any part or parts thereof except tubes, transistors, fuses or batteries which shall, within one year after making delivery to the original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective.

Instruments returned under this Warranty will not be accepted at the Datapulse plant without prior authorization by a Datapulse representative or by the service manager of Datapulse Incorporated.

Datapulse Incorporated reserves the right to make changes in design at any time without incurring any obligation to install same on units previously purchased.

This Warranty is expressly in lieu of all other obligations or liabilities on the part of Datapulse Incorporated and Datapulse Incorporated neither assumes nor authorizes any other person to assume for them any other liability in connection with the sales of Datapulse Incorporated instruments.

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